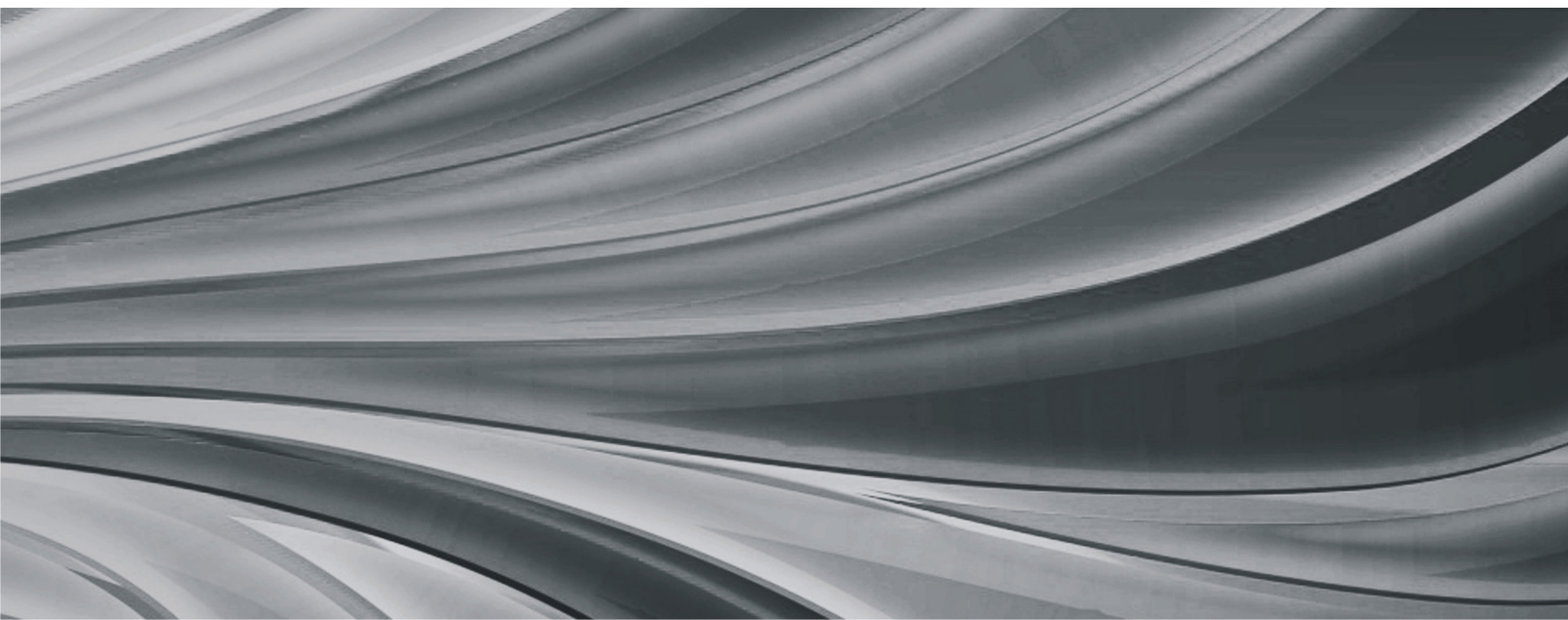


EYE HEALTH & ACCOUNTABLE CARE

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EXECUTIVE SUMMARY

The demands of health care reform have forced industry stakeholders to expend tremendous resources to identify and eliminate inefficiencies in the health care delivery system. One example can be seen in the delivery of eye care services. A recent study commissioned by the American Optometric Association demonstrates that significantly higher costs result from inappropriate utilization of Emergency Room (ER) facilities and Primary Care Physician (PCP) offices by patients seeking medical treatment for eye problems. Results of the study revealed that by diverting eye care services from the ER or PCP settings to eye care professionals in an outpatient setting, the following benefits can be realized:

1. Improved clinical outcomes; and,
2. A potential cost savings of \$0.18 Per Member Per Month (PMPM).

Better clinical outcomes and lower overall health costs are core components of any value-based health care strategy; innovative benefit design, provider network configuration and administrative support systems that allow direct patient access to eye care professionals will achieve significant cost savings for payers and purchasers of eye health and vision care services while improving patient outcomes for those in need of eye care.

STATEMENT OF OPPORTUNITY

In the United States, it is widely accepted that a primary care physician (PCP) or general practitioner is typically the first point of contact for patients needing medical care. However, considering all the acute care and treatment provided (354 million annual acute care patient visits in the U.S.), current research shows that only 42% of patients visit their PCP, while 28% go directly to the ER, 20% see a specialist, and 7% seek treatment in an outpatient facility. Remarkably, less than half of all acute care visits are managed by a patient's personal physician (Pitts et al, 2010).

The Affordable Care Act and recent national health policy developments support a market shift toward integrated, coordinated, accountable care. The new law has ignited the creation of Accountable Care Organizations (ACOs) and Patient Center Medical Home (PCMH) model practices and provider networks. The rapid growth of these entities and other value-based purchasing initiatives brings focus to the importance of achieving quality patient outcomes through timely, appropriate service delivery.

The fundamental challenge for optometry in the era of accountable care is two-fold: first, getting the patient in need of care to the right place for the appropriate services; secondly, but tied to the first point, is getting the right diagnosis and correct medication to best meet the patient's needs.

Our study analyzed appropriateness of service delivery by reviewing the cases of 475,941 patients who went to an Emergency Room (ER) or a PCP for management of eye problems which could have been seen in an optometric practice. We examined the appropriateness of care based on two hypotheses.

By centering our first hypothesis on the notion that eye care currently being delivered in the ER and PCP office settings can be improved if redirected to an optometric office setting, we examined the following:

Hypothesis 1: When patients visit Emergency Rooms and Primary Care Physicians' offices, the overall cost of eye-care (total spend) escalates. We wanted to determine whether a significant cost savings could be realized if patients were treated by eye care professionals in their offices instead of ERs.

Hypothesis 2: When patients seek medical eye care from Emergency Rooms and Primary Care Physicians, they may be inconvenienced (as

measured by multiple visits, changes in diagnosis and/or changes in prescribed drugs on subsequent visits) and overall care quality may suffer.

Our two hypotheses bring to light several care-delivery issues where excessive costs and patient inconvenience can be remedied: ER diversion, PCP diversion, misdiagnosis, and duplication of pharmaceutical prescriptions. Regarding the first hypothesis, more often than not, additional unnecessary costs are borne by both the patient and the health plan for care delivered in an ER or a PCP office setting. With regards to the second hypothesis, patients may be inconvenienced by needlessly going to multiple locations to receive the most appropriate diagnosis and treatment. By calculating total visit costs for all ER visits for non-emergent eye conditions compared to non-emergent visits to eye care professionals' (optometrists and ophthalmologists) office settings for the same conditions, we can compare and contrast the cost and quality-of-care relationships between and amongst different eye care delivery settings. We believe employers, health plans and patients can derive significant cost savings and improved patient outcomes by making relatively simple changes to health plan benefit packages and health plan participating provider networks.

RESULTS AND DISCUSSION – HYPOTHESES TESTING AND OUTCOMES

Jill, a 47 year old, finds herself in great discomfort on the evening of January 6th. She has significant pain in and around her right eye. Rushing to the ER she waits for several hours until she is seen by an emergency care physician specialist. Despite being seen in the ER, Jill is referred to an optometrist for further evaluation and treatment. A day later, after seeing an optometrist, Jill is informed of a superficial injury to her cornea. After the correct diagnosis and treatment is prescribed, Jill is on her way to a rapid recovery. If only she knew to head to her local optometrist first?

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Hypothesis 1: When patients use Emergency Rooms and Primary Care Physicians' offices, the overall cost of eye care escalates.

There is clear evidence that when a patient uses the emergency room for eye care, costs (total eye care spend) escalate. Our study demonstrated potential cost savings of \$0.114 PMPM if members had direct access to optometrists and were diverted away from ER's for non-emergent eye care. Similarly, we found that even when patients go to their Primary Care Physician (as most patients are reminded to do), they are often misdiagnosed (as indicated by a clinically significant change in diagnosis when the patient is seen for follow-up care in an optometry or ophthalmology office setting). We found that there could be additional savings of \$0.062 PMPM if a patient were to visit an eye care professional as the first point of care and receive the correct diagnosis. Based on our analysis of all health care claims included in the study and looking specifically at the amount of money spent on medical eye care, we found:

- 91.5% savings (\$18.4 million) of total dollars spent on medical eye care at ERs (\$20.1 million) can be achieved by diverting ER patients to eye care professionals in an office setting;
- \$9.9 million can be saved by diverting patients seeking eye care from PCPs to eye care professionals;
- \$0.55 million can be saved by avoiding the mis-prescribing of pharmaceuticals by providers other than eye care professionals.
- \$28.85 million was estimated as the total savings, which represents 2.9% of eye-related medical expenditure.

Hypothesis 2: When patients seek eye care from Emergency Rooms and Primary Care Physicians, they may be inconvenienced and care quality may suffer.

Many individuals make incorrect assumptions about the most appropriate setting when seeking eye care services. Many believe that they can receive high-quality eye care at an Emergency Room or Primary Care Physician office setting. Neither of these assumptions is borne out by the evidence. To the contrary, patients are often misdiagnosed and receive incorrectly prescribed medications when seeking eye care in these two settings. The results are additional unnecessary patient visits, changes in patient diagnosis and/or changes in drugs prescribed.

Deborah, a 42 year old female employee wakes up early on a November morning, unable to open her left eye. She has pain, excessive tearing, and itchiness. Deborah quickly calls her PCP. Diagnosed with unspecified conjunctivitis, commonly referred to as pink eye, Deborah follows the treatment recommended by her PCP but is not getting any relief. One week later Deborah visits her optometrist. The optometrist identifies that this is not pink eye, and removes a foreign object from Deborah's eye. Properly diagnosed and treated, she recovered quickly with no loss of sight.

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We found that 22.8% of ER visits pertaining to medical eye care resulted in the patient having a subsequent visit to a specialist due to a misdiagnosis at the ER.

- Our research results indicated a greater than 75% misdiagnosis rate when patients seeking medical eye care receive care at an ER of from a PCP.
- A comparative analysis of prescriptions for topical ocular pharmaceuticals by eye care professionals, general practitioners and emergency room physicians uncovered a significant disparity in preference (when considering topical drugs of first choice):
 - Primary care providers were found to prefer the amino glycoside class, no longer considered state of the art, in 49% of cases. This older class antibiotics causes significant corneal toxicity;
 - In contradistinction, a review of the prescribing patterns of eye care specialists demonstrated that state-of-the-art fluoroquinolone preparations were considered as the topical drugs-of-first-choice in 80% of instances.

Ultimately, the onus is on the patient at the time eye care is needed to determine the most appropriate source of care. Members/patients should be educated to better understand the true cost of care and where they should go to receive the most appropriate treatment. Adequate educational materials and outreach campaigns are required to drive positive behavior change and divert patients from using improper service delivery settings in their time of need. This study demonstrates that there are significant cost savings to be realized if patients receive proper care at the first point of care. One imperative is that the health care delivery system must afford patients the opportunity to easily access eye care providers. Furthermore, integrating eye health and vision benefits into health and medical benefit plans and including optometrists in health plan provider networks not only leads to significant cost savings, but also improves the overall quality of patients' experience, and drives positive health outcomes.

CONCLUDING STATEMENT AND PROPOSED SOLUTION

A particularly common occurrence in eye care is the needless fragmentation of eye care services into two distinct components: medical eye care and vision care. Vision care, commonly provided through what are known as “vision plans”, typically covers a wellness eye exam and material benefits (eyeglasses and contact lenses) and rarely covers any medical eye care services. Moreover, when vision plans do provide a benefit for medical eye care, the coverage is usually extremely limited, further fragmenting the delivery of eye care services. Additionally, vision plans may not use the same participating provider panel as the companion health plans, causing confusion for patients when deciding where to obtain needed eye care.

The inclusion of comprehensive eye health and vision care services as a covered benefit in health plans facilitates simpler, more direct access to expert eye care professionals. Appropriate inclusion of eye care professionals (optometrists and ophthalmologists) as participating providers in health plan provider networks to more efficiently provide expert care solutions (often not apparent or known to providers who are not eye care professionals) can lead to significant cost savings on medical eye care services.

Our study exposes issues and raises concerns to be considered regarding the appropriate delivery of eye care services. More importantly, it illuminates an opportunity to significantly improve patient outcomes and realize cost savings for health plans, purchasers, and patients that can result from more appropriate utilization of optometric services within standard health plan coverage.

This study clearly revealed that eye care delivered in an eye care professional’s office setting, such as an optometric practice, is less costly for all equivalently diagnosed and treated eye conditions as compared to eye care services delivered in an Emergency Room. Providing care in this more appropriate manner by eye care professionals in their office setting results in fewer total patient visits with no compromise in outcomes. By including eye care services delivered by optometrists as a primary benefit in health plans, and by encouraging members/patients to visit eye care professionals for medical eye care as a compelling alternative to an ER, the average health plan could realize a saving in total eye care spending of approximately just under 3%.

In addition to this tangible benefit, a clear opportunity exists for purchasers, payers and patients to improve patient experience while reducing

Jeff, age 53 awakes with a painful, red, irritated right eye. Knowing that he already used his vision benefit, he elects to go to the ER. After 4 hours in the ER, Jeff is diagnosed with allergic conjunctivitis and given eye drops for allergy. The total cost for this visit including prescription is \$535. Several days later with no improvement, Jeff sees his optometrist and is properly diagnosed with uveitis and prescribed the correct medication.

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costs for eye health and vision care services. Equally important, this improved care delivery adds value for employers and employees by increasing employee morale and by reducing lost productivity that accompanies absenteeism that occurs when evolving or prolonged ocular illness requires multiple physician encounters and protracted treatments.

Our study demonstrated that inappropriate ER and PCP visits and incorrectly prescribed medications accounted for a total of \$28.9 million (18.1 cents PMPM) in extraneous costs that could have been avoided with proper education and integration of optometric care into the healthcare system. The study clearly proves our stated hypotheses and demonstrates that eye care delivered in an ER or PCP office setting is less than optimal for the patient, as the diagnosis and prescribed medications are often incorrect or inadequate. Outreach and member education are essential for insuring that patients have direct access to optometrists and for improving current inefficiencies in the delivery of eye care. Improving access to optometrists as primary eye care providers and thereby helping patients and eye care professionals achieve more positive health outcomes at lower cost is entirely consistent with the fundamental principles of health reform and the demands of a changing market.

As the healthcare system is transformed, we must remain mindful of population health management and the entire spectrum of health care services required – a spectrum that includes total eye health and vision care as well as chronic disease management and preventive care. By including eye care providers in an integrated system that delivers quality care at the first point of contact, extraneous costs both from a patient and a system perspective can be mitigated.

By coupling comprehensive eye health and vision care services as covered benefits in health plans with the inclusion of eye care professionals (optometrists and ophthalmologists) as participating providers on health plan provider panels, employers and health plans can achieve cost savings while improving patient outcomes.

Integration of eye care services into health plans whether for ocular wellness, preventive care, medical/emergency eye care, or chronic care provides a practical solution for payers, purchasers and patients and delivers value on three primary levels:

1. Improved access to eye care services;
2. Appropriate initial intervention and continuity of care;
3. Accurate diagnosis and treatment.

Optometrists, in their expanded therapeutic role, have provided successful medical intervention for their patients and functioned as a respected

member of the healthcare community for over 30 years. Their unencumbered inclusion in the system and allowing them to practice at full professional scope as educated and licensed should be endorsed by all third party payers and purchasers of health care services and related benefits.

For eye care, it can be simply stated as ***the RIGHT EYE CARE, in the RIGHT PLACE, at the RIGHT TIME!***

APPENDIX I - BACKGROUND AND PURPOSE OF STUDY

Evidence-based data has successfully illuminated that clear benefits can be realized when appropriate treatments are delivered by knowledgeable and well trained expert professionals. The American Optometric Association (AOA) postulates that optometric services are not currently being appropriately utilized by health plans (i.e. not as effectively or efficiently as can be). More specifically, the AOA believes that optometric office visits are currently underutilized, and if appropriately utilized, could result in more efficient and effective treatment than is currently provided in both ER and PCP settings.

The evidence shown in this study underscores the fact that misuse of eye care services and underuse of optometrists to provide medical eye care services can exacerbate the ongoing crisis in health costs. In order to investigate this hypothesis, a study to be performed by SCIO Health Analytics was commissioned by the American Optometric Association. The study specifically focused on the potential benefits of appropriate eye care service delivery in various settings (e.g. eye care professionals' office setting, Emergency Room (ER) and Primary Care Provider (PCP)) and poses the question as to whether these services are clinically effective (i.e. diagnosis was correct), cost effective (i.e. minimized cost to the patient) and patient-centric (i.e. minimized patient inconvenience). This study analyzed the current costs for eye care services provided by eye care practitioners and compared those costs to the costs of clinically-similar care provided to patients seeking eye care in the ER. Furthermore, this analysis highlighted the major clinical reasons why consumers seek eye care services and the outcomes of non-emergent eye care provided in the ER.

The fundamental challenge in the delivery of eye health and vision care services today is two-fold: First, it's about getting the consumer to the right place at the right time for appropriate care services; and secondly, but related to the first, it's about getting the right diagnosis and most appropriate treatment and medication(s) to truly meet the patient's needs. **It's about getting the patient *the RIGHT EYE CARE, in the RIGHT PLACE, at the RIGHT TIME.***

At the project onset, it was believed that enrollees in non-government sponsored health plans and ERISA-qualified employer health plans frequently utilize the emergency room (ER) setting for eye care services that could be performed in an outpatient optometric office setting. Further-

more, it is important to note that these enrollees often sought care from a secondary or tertiary specialist for conditions commonly diagnosed and treated by optometrists. SCIO Health Analytics was contracted by AOA to analyze care delivery within both ER and PCP settings in order to determine the potential cost savings that could be realized if care was appropriately re-directed on the initial visit to an eye care professional's practice setting.

APPENDIX II - DEFINING THE PROBLEM

Patients are often confused because they do not know where to go first for eye care. Patients with medical eye conditions (e.g. corneal abrasion, conjunctivitis, glaucoma, traumatic iritis, retinal detachment etc...) often seek care from their primary care physician (PCP), the emergency room (ER), an urgent care facility or from their vision care provider. More often than not, patients receive care at an ER or from their PCP because covered optometric services are accessible only through an eye care benefit that is designed around well eye care exams and refractive services and not the full-scope medical eye care services that optometrists are authorized and licensed to perform.

Integrating optometric care as well as eye health and vision benefits provides an optimal solution for payers, purchasers, and most importantly patients, while also producing significant gains in efficiency and quality outcomes. Although many patients equate “vision or refractive plan” services with “medical eye care” services, they would prefer to receive all of their eye care services from one provider. “Vision Plan” providers are frequently prohibited from becoming medical plan providers on companion medical plan provider panels for a number of reasons. Ultimately patients are often surprised to find that their “eye care” benefit actually excludes their habitual and familiar provider from participating in their care when the issue is urgent and medical in nature, a condition which is unique to the profession of optometry (ophthalmology does not endure these exceptions). Including these services as primary health and medical benefits for members of health plans creates greater access to medical eye care services in an optometric setting rather than an ER or PCP setting, and the appropriate utilization of each could lead to significant cost savings for health plans, employers and patients. This study and its results are intended to highlight areas of significant potential cost savings for those health plans that include professional optometric services in standard health plan coverage and include optometrists as participating providers in their health plan provider networks.

APPENDIX III - SUPPORTING DOCUMENTATION

An Interesting Side Note Unique to Eye Care Professionals

A particularly common situation facing the eye care industry is that in many circumstances vision care has been carved out of total eye health care and in many cases is not covered by health insurance plans. Rather, in many cases, employees are forced to select a separate “vision plan” to cover self-referred well-eye-care visits. Of particular interest is a survey conducted by Harris Interactive (2010) which found that one in four employees choose not to enroll in their employer’s vision plan. This coverage decision (or lack of) and the resulting lack of access to and coverage for professional optometric services can cause the inappropriate use of services provided by non-eye care specialists in an ER, PCP or Urgent Care setting, which can lead to less than satisfactory patient experiences. In order to correct this situation and convince decision-makers to make needed changes, the eye care industry must conduct research that directly examines the relationship between eye care services and specific eye care delivery settings (e.g., Emergency Room and, PCP).

This study posits that by integrating eye health and vision benefits into health and medical benefit plans (and including optometrists in health plan provider networks), significant cost savings can be realized, and improvements in the overall quality of patient care will drive better overall health outcomes.

Literature Review

A review of the literature shows that very little has been done on this topic. Studies indicate that patients presented with ocular complaints represent approximately 3% of emergency visits (Babineau, 2008). Our study examines the utilization of ER and PCP services as it relates to the total costs, and paid costs by the patient.

While the literature has been vague on this topic from an eye care perspective, there have been some direct references made toward eye care and inappropriate use of emergency room services. Carret, et al (2009) noted that three descriptive studies indicate “that the principal diagnosis or complaints among persons that consulted the ED inappropriately were [for] eye and ear complaints.” The latter study concludes that the median of non-urgent ED is 32% based on 27 studies. Similarly, Sempera-Selva, et al (2001) mentioned that “alterations of the eye, allergic reactions, conjuncti-

vitis, and alterations of the ear and sensory organs showed rates of inappropriate use that were greater than 75%.”

While research is at times sparse with regards to Optometry and emergency room (ER) visits, it is clear from the research that a large percentage of these visits may be classified as inappropriate. Carret (2009) suggests that inappropriate ED use varies from 20% - 40% -- with age and income being seen as important determinants. With approximately 120 million ED visits annually (Niska, et al, 2010), the percentage of inappropriate use is significant. This paper suggests that inappropriate eye care lends substance to this argument.

The cost of emergency room visits continue to increase. A 2005 article (Bamezai, et al.) showed that ED visits increased by over 10% during a 10 year timeframe. These authors suggest, along with others, that a significant percentage of these patient visits could be treated outside of the emergency room environment – with no significant decrease in quality or outcome. They suggest that the marginal cost of an outpatient ED is high and that there is a need to examine the how, when and where to deliver non-urgent care. Yet, Williams (1996) suggests that the marginal impact of diverting care to alternative settings may be overstated – especially when focusing on non-urgent care. Their study suggests that about 1/3 of all visits are non-urgent. Salient to this discussion, Durand et al (2011) examined the relationship between care type (urgent, non-urgent) and emergency room utilization and found through their cross sectional study, that there is still a great deal of ambiguity in terms of measurement efforts thereby leading to faulty or unreliability of efforts to study ED room utilization.

It is clear that education is important for changing ED room utilization. Sempere-Selva, et al (2001) suggests that patient preference is a key driver of use. The intensity of these drivers varies by age, diagnostic category as well as access to transportation. Most importantly, they find that patients trust the hospital setting more than they do the alternative setting. These findings may be rooted in the fact that many patients do not have an identified provider or PCP, or more importantly do not realize that their optometrist is the most appropriate individual to see for their primary eye conditions.

APPENDIX IV - SCIO HEALTH ANALYTICS STUDY

Data Base

For this study, SCIOinspire's utilized proprietary clinical benchmark data-base which represents over 4 million unique members' claims over 4 years (2006-2009). The population was a traditional commercial study population with an average age of less than 65 years. Individuals included those who may or may not have had pharmacy coverage (we leveraged available pharmacy Rx coverage and applied eligible months of coverage in deriving adjusted results). To ensure that dollars are treated equally over time, all financial data was updated to 2010 dollars using the Medical Care CPI from the Bureau of Labor Statistics website. For this analysis, Medicare members have been removed. The average medical expenditure per member per month for this reporting period is \$246.

Study Design

The analysis below compares average costs for ER visits and optometric office visits. As discussed below, the methodology takes great care to ensure these comparisons are clinically similar. Savings are estimated by comparing optometry services to PCP or ER services by the type of service avoidance we postulated for various types of savings. To perform this analysis we limit both ER visits and specialist office visits to those with an 'eye related' diagnosis code. This comparison is designed to estimate potential savings associated with replacing emergency room visits with optometric office visits for common eye conditions. The study parameters include:

- ER and office visits for eye conditions are limited to those with an ocular diagnosis in the primary diagnosis¹ code field.
- Specialist office visits are associated with an "Evaluation and Management", "Eye Exam", "After Hours Visit", Surgical code, or specific Radiology or Ultrasound CPT code^{2,3}.

¹ Eye condition diagnosis codes are defined as ICD-9-CM codes with the following first three digits: '360', '361', '362', '363', '364', '365', '366', '370', '371', '372', '373', '374', '375', '376', '377', '378', '379', '918', '921', '930', '940'

² CPT Codes Copyright 2010, [American Medical Association](#). All Rights Reserved. CPT is a registered trademark of the American Medical Association.

³ ER 'eye examination' CPT codes include:

'99285', '99284', '99283', '99282', '99281', '99244', '99243', '99242', '99241', '99215', '99214', '99213', '99212', '99211', '99205', '99204', '99203', '99202', '99201', '92014', '92012', '92004', '92002'

After Hours Codes: 99050; 99051; 99053; 99056; 99058; 99060

Surgical Codes for Foreign Body Removal: 65205; 65210; 65220; 65222

Radiology (ultrasound) Codes: 76510; 76511; 76512; 76513; 76514; 76516

- Average costs per ER visit are calculated for each three-digit diagnosis code grouping (Major Diagnostic Category-Appendix VII).
 - Average costs are calculated as the sum of all professional and facility claim line dollars for each ER visit's date of service divided by the total number of visits within each MDC.
- Average cost per office visit is the sum of all professional claims with the correct diagnosis and CPT code divided by the number of visits.
- ER visits that result in an inpatient admission, and office visits associated with an ER visit or inpatient admission are not included in this analysis.

Professional office visits with the appropriate diagnosis code and CPT code are identified by provider type '41' (Optometry) and '18' (Ophthalmology).

Methodology

We noted three comparisons in this research. The basic premise was to determine cost savings by replacing current practice patterns without eye specialists with primarily those with optometry services for eye conditions. Three sources of savings were identified:

- Savings associated with replacement/avoidance of ER visits
- Savings associated with replacement/avoidance of PCP visits
- Savings associated with mis-prescriptions of pharmacy by non-eye specialists

Study results were calculated as follows:

- Average visit costs for ER visits, as defined above, are compared to the average visit costs for optometry visits with the same 3-digit diagnosis code.
- Per visit savings are estimated as the difference between the two averages.
- Total savings per condition is equal to the number of ER visits for that condition times the per visit savings.
 - Total savings is equal to the sum of all condition savings.
- Savings are estimated for total allowed amount, total member paid amount, and total insurer paid amount. Total eye care spending was calculated using all facility and professional claims with an eye care related diagnosis code in the primary position.

ER, PCP office visits and pharmacy drugs were limited to those with an eye diagnosis⁴ in the primary diagnosis code field, or a pharmacy 4-digit GPIs for eye-related drugs. Additionally, specialist office visits were associated with an “Evaluation and Management”, “Eye Exam”, “After Hours Visit”, or specific Radiology or Ultrasound CPT code⁵. Average costs per ER visit were calculated for each three-digit diagnosis code grouping (Major Diagnostic Category – Appendix VII). These costs are calculated as the sum of all professional and facility claim line dollars for that visit’s date of service, divided by the total number of visits within each MDC. Average costs per office visit were calculated using the sum of all professional claims with the correct diagnosis and CPT code, divided by the number of visits. The following were removed from the analysis:

- ER visits that resulted in an inpatient admission
- Office visits associated with an ER visit
- Inpatient admissions

Professional office visits with the appropriate diagnosis code and CPT code were separated into optometry and ophthalmology visits based on the provider specialty code associated with the claim.

Misdiagnosis Analysis

“Misdiagnosis” is defined as any change of diagnosis code between the initial ER or PCP office visit and the subsequent eye specialist office visit. This can take the form of additional detail provided by the eye care specialist (ie, “unspecified conjunctivitis” to “acute atopic conjunctivitis”) or a complete revision of the original diagnosis (“contusion of eyeball” to “hyphema”). Any change of ICD-9 diagnosis code through the 5th digit resulted in an episode being flagged as “misdiagnosed” (though this includes diagnosis revisions, we use the label “misdiagnosis” for this paper – refer to Appendix VIII for further explanation). In this analysis we focused on the most relevant and interesting but preventable occurrences.

⁴ Eye condition diagnosis codes are defined as ICD-9-CM codes with the following first three digits: ‘360’, ‘361’, ‘362’, ‘363’, ‘364’, ‘365’, ‘366’, ‘370’, ‘371’, ‘372’, ‘373’, ‘374’, ‘375’, ‘376’, ‘377’, ‘378’, ‘379’, ‘918’, ‘921’, ‘930’, ‘940’

⁵ ER ‘eye examination’ CPT codes include: ‘99285’, ‘99284’, ‘99283’, ‘99282’, ‘99281’, ‘99244’, ‘99243’, ‘99242’, ‘99241’, ‘99215’, ‘99214’, ‘99213’, ‘99212’, ‘99211’, ‘99205’, ‘99204’, ‘99203’, ‘99202’, ‘99201’, ‘92014’, ‘92012’, ‘92004’, ‘92002’.

After Hours Codes: 99050; 99051; 99053; 99056; 99058; 99060

Surgical Codes for Foreign Body Removal: 65205; 65210; 65220; 65222

Radiology (ultrasound) Codes: 76510; 76511; 76512; 76513; 76514; 76516

Specialist “eye examination” CPT codes include: ‘92002’, ‘92012’, ‘92004’, ‘92014’, ‘99201’, ‘99202’, ‘99203’, ‘99204’, ‘99205’, ‘99211’, ‘99212’, ‘99213’, ‘99214’, ‘99215’, ‘99241’, ‘99242’, ‘99243’, ‘99244’, ‘99245’.

After Hours Codes: 99050; 99051; 99053; 99056; 99058; 99060

Surgical Codes for Foreign Body Removal: 65205; 65210; 65220; 65222

Radiology (ultrasound) Codes: 76510; 76511; 76512; 76513; 76514; 76516

Data and Results

Overall Savings

When examining the file, we found that the combined savings from ER and PCP encounters, along with incorrectly prescribed drugs totaled \$28.9 million. This translates into a savings of 0.18 cents PMPM. The numbers are all trended to 2010 dollar terms using the medical trends observed in the PMPM averages between these four years (2006-09).

ER Diversion Savings

Estimate savings associated with eye examinations (including minor surgical procedures) conducted within an optometric office visit when compared to eye examinations conducted within an emergency room setting.

ER Encounters

Members with a non-inpatient ER encounter for eye-related diagnoses were analyzed for post-ER services. We analyzed 58,819 such member encounters. Three potential scenarios arise around the post-ER time frame.

1. *Members who do not have any additional covered visits with any provider.* These members have their problem diagnosed at the ER. They could have gone directly to the eye specialists and taken care of their problem at lower costs. The diversion savings, defined as the difference in average costs between ER and optometrists' costs is the potential savings. This additional cost could have been saved if the members had gone to the optometrists. The total cases in this category numbered 43,146. **Total savings: estimated is \$12.6 million, or 7.8 cents PMPM.**
2. *Members who have follow-up visits with other physicians not related to an eye condition.* There were 2,283 member encounters of this type. These members have other health related problems which precluded eye-related problems. **Total savings: No diversion savings were calculated for this cohort.**
3. *Members who consulted with eye specialists after the ER.* There were 13,390 such member encounters within a span of 14 days (22.8%). **Total savings: estimated is \$5.8 million, or 3.6 cents PMPM.** The sources of savings for this category are derived from the following sub-categories:
 - a. *Members who were misdiagnosed.* We compared the ER primary diagnosis with those from the eye specialist(s) in the 14-day window. If the original ER diagnosis appeared to be different from the subsequent diagnoses by eye-specialist(s) then we termed these types of episodes as misdiagnosed. We found 8,948 such episodes out of 13,390 ER episodes were misdiagnosed (66.8%). The savings

associated with such episodes are costs of ER visits as well as the costs associated with specialist visits. Out of the \$5.8 million savings cited above, misdiagnosed episodes contributed \$4.0 million, or 2.5 cents PMPM savings.

- b. *Members who were not misdiagnosed.* A sizeable portion (n=4,442) of members were not misdiagnosed in that 14-day window. We estimated savings for this source as the difference in costs for ER visits versus optometrists' average office visits. This source contributed \$1.8 million overall, or 1.1 cents PMPM savings.

Overall Savings from ER Diversion is Estimated at \$18.4 million or 11.4 cents PMPM

PCP Encounters

The second category of savings was estimated post PCP visits. The category includes all members that had encounters with their PCPs for eye related diagnoses. These members were followed for up to 14 days to understand their final dispositions. We analyzed 417,112 PCP encounters and arrived at two scenarios.

1. Members have consulted eye specialists. We analyzed 417,000 PCP encounters with eye-related problems. 5.2% of the encounters (n=21,700) were followed up with visits to optometrists or ophthalmologists. There were two types of outcomes for these members' encounters.
 - a. *Members who were misdiagnosed.* Number of PCP encounters which were misdiagnosed for eye-related problems by the PCP numbered 17,492 encounters (80.6%). The comparisons of diagnoses were made from 3-digit to 5-digit ICD-9 diagnoses codes. Total saving from this type of encounters was \$9.9 million, or 6.2 cents PMPM.
 - b. *Members who were not misdiagnosed.* We did not create any types of diversion savings from this category of encounters (n=4,208).

Overall Savings from PCP Encounters is Estimated at \$9.9 million – 6.2 cents PMPM

Pharmacy Mis-Prescriptions

The third category of savings was created from wrong pharmacy scripts written by ER providers or PCPs. The determination of wrong or correct prescription is determined through comparisons of first script(s) written by the ER or PCP providers and comparing those written by eye specialists, for eye-related drugs. We used a select list of drugs using 4-digit generic product identifier (GPI), and then used 14-digit GPI number as means of comparisons. The results of this comparison are as follows:

1. We did not find significant changes in drugs between the ER sources and subsequently with eye-specialists. The reason is very few people have scripts written immediately after ER visits. As such, we did not estimate savings from this source.
2. The second source of savings resulted from post-PCP encounters. Patients who had scripts presumably written by their PCP, and comparing such scripts with those written after they had eye-specialist visits, we determined two types of cases.
 - a. Members who were misdiagnosed. Scripts written by PCPs were compared with those written by eye specialists. The number of cases where we saw variance in the drug list were 1,840 encounters out of the total 17,492 (10.5%) such encounters. Total saving resulting from these mis-prescriptions was \$409,570 or 0.36 cents PMPM.
 - b. Members who were not misdiagnosed. We saw some variance in the scripts between the providers. There were 328 such cases out of 4,208 overall where pharmacy drugs could have been mis-prescribed by the original PCP visits. Total savings is small, approximately \$164,000, or 0.1 cent PMPM.

Overall savings from pharmaceutical mis-prescriptions is estimated at \$0.55 million or 0.5 cents PMPM.

All combined, total savings from ER diversion, PCP diversion and pharmaceutical mis-prescription avoidance is estimated to be 18.1 cents Per Member Per Month (PMPM).

APPENDIX V - CLINICAL EFFICACY: MIS-PRESCRIBED PHARMACEUTICALS

The success of any pharmaceutical management plan essentially depends on three integrated variables: 1) the correct diagnosis, 2) the selection of an accepted and proven therapeutic treatment, and 3) the patient's compliance with the treatment as dispensed over a correct and accepted duration. The diagnosis of any disease is dependent upon the raw knowledge of the clinician, the ability of the practitioner to gather data and the experience and intuition of the physician to interpret the information. Medication prescribing patterns are born from anecdotal experiences, clinical and evidence based trials as well as knowledge of the availability of options in the armamentarium.

A rudimentary analysis for the prescribing of topical ocular pharmaceuticals between the years of 2006-2009 was performed evaluating the prescribing patterns of eye physicians, general practitioners and emergency room physicians. Results comparing the selections of topical drugs-of-first choice between these professionals uncovered a significant disparity in preference. Primary care providers (internists) were found to prefer the aminoglycoside class (gentamycin, tobramycin, neomycin) in 49% of cases with gentamycin sulfate ophthalmic solution prescribed 28% and tobramycin sulfate ophthalmic solution prescribed 21% of the time, respectively. Sulfacetamide sodium ophthalmic solution was also documented as a top-ten ranked selected agent. In this limited assay, the selection of topical fluoroquinolone preparations were only documented 37% of the time.

In contradistinction, a review of the prescribing patterns of eye care specialists demonstrated that state-of-the-art fluoroquinolone preparations were considered as the topical drugs-of-first-choice in 80% of instances with moxifloxacin hydrochloride being the most selected agent. The two most popular aminoglycoside medications prescribed by non-ocular physicians (tobramycin and gentamycin) failed to rank within the top five selections. Further, gentamycin was ranked below number 10.

The timely revision of superficial ocular diseases requiring topical intervention is dependent upon correct identification, prompt initiation of an appropriate topical medication, the formulation of an appropriate dosing schedule and patient compliance. The efficiency by which these maladies are eradicated depends upon the knowledge of the physician, the equipment available for making observations and gathering data, the experience of the diagnosing and treating practitioner, the knowledge of the

best available medications and the confidence the clinician inspires within their patients leading to compliance. Treatment failures can be attributed to missed observations secondary to antiquated or absent state-of-the-art instrumentation, missed diagnoses as a result of inexperience or incomplete knowledge base, the selection of inappropriate or ineffective combative agents or the selection of a less than optimal dosing regimen.

Ethics must play a role within the decision making. Treatment failures are not merely an inconvenience. Under the best of circumstances, the patient is left with increased discomfort, prolonged loss of function and debt that is realized in money, time and productivity. In the worst of circumstances, untreated superficial ocular disease has the potential to leave scars that can impart permanent and lasting morbidity.

APPENDIX VI - FINAL THOUGHTS

This analysis is intended to highlight areas of significant savings for health plans that can be generated by adding optometry services to standard health plan coverage. We found that office visits within an optometric office are less expensive for all equivalently diagnosed and treated eye conditions as compared to services provided in an Emergency Room or in a PCP office. Providing care in this manner is more effective and efficient for the member and represents an opportunity for significant cost savings to a health plan. By including optometric medical eye care services as a primary medical benefit and as a strong alternative to an ER, the average health plan could realize a saving in total eye care spending by just under 3%. These savings represent the minimum achievable savings for health plans from adding optometrists to the standard medical coverage package. Further savings, although marginal, can be achieved through improvements in the quality of care and reducing the number of mis-prescriptions, which is estimated at approximately \$0.5 cents PMPM.

APPENDIX VII: EYE CONDITION MAJOR DIAGNOSTIC CATEGORIES¹

360	Disorders of the globe
361	Retinal detachments and defects
362	Other retinal disorders
363	Chorioretinal inflammations, scars, and other disorders of choroid
364	Disorders of iris and ciliary body
365	Glaucoma
366	Cataract
370	Keratitis
371	Corneal opacity and other disorders of cornea
372	Disorders of the Conjunctiva
373	Inflammation of eyelids
374	Other disorders of eyelids
375	Disorders of lacrimal system
376	Disorders of the orbit
377	Disorders of optic nerve and visual pathways
378	Strabismus and other disorders of binocular eye movements
379	Other Disorders of the eye
918	Superficial injury of eye and adnexa
921	Contusion of eye and adnexa
930	Foreign body on external eye
940	Burn confined to eye and adnexa

¹ ICD-9-CM 2011-2012 International Classification Of Disease, Ninth Revision, Clinical Modification, Sixth Edition, Volume 1, 2, & 3.

APPENDIX VIII - MISDIAGNOSIS REFINEMENT AND ADJUSTMENT

SCIO Health Analytics engaged a highly-qualified optometric consultant to further analyze and refine how we determined which cases should be classified as a misdiagnosis as we use the term in our paper. The optometric consultant reviewed each case where either the 4th or 5th digit of the diagnosis code had been changed after a patient first went to an ER and then visited an eye care professional for follow-up care within 14 days when the revision of the diagnosis code was made.

The consultant determined for each case whether the code change was truly a misdiagnosis or merely the same condition that should not be considered a misdiagnosis. For example, a change involving ICD 366.15 senile cortical cataract and ICD 366.16 senile nuclear cataract would not be considered a misdiagnosis despite the 5th digit change. Another example determined to be a misdiagnosis is ICD 370.01 marginal corneal ulcer changed to ICD 370.03 central corneal ulcer.

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